

Association between hindrance stress and state anxiety: the moderating role of HPA-axis function to acute stress

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Abstract

Objective: Nowadays, young adults are facing stressors from several aspects. They have already become the most anxious groups in Chinese society and in risk of developing a series of anxiety disorders. The theory of challenge-hindrance stress was proposed to explain the positive and negative outcomes of different stressors. It has been widely tested mostly in the field of organization and management. In the current study, we used the challenge-hindrance stress theory to clarify the association between stress in daily life and anxiety. We also examined the HPA-axis function buffering the influence of daily stress on anxiety.

Methods: we used the edited Chinese version of challenge-hindrance stress scales to measure challenge and hindrance stress over 6 months. The level of anxiety was measured by state-trait anxiety inventory. We also carried out a Trier Social Stress Test (TSST) in laboratory and recorded the change of cortisol level during the 60 minutes right after the acute stress.

Results: Results show that the recent level of hindrance stress positively predicts trait anxiety, but the level of challenge stress does not predict trait anxiety. It is also found that, the cortisol decline rate during the recovery of acute stress moderates the association between stress and anxiety. To be exact, individuals with low cortisol decline rate could not recover to baseline level even after rather long rest, and hindrance stress in their lives would lead to higher level of anxiety. But for individuals who has high cortisol decline rate after acute stress, they recover fast to baseline after the stressor disappear, and they become less anxious although facing the same level of hindrance stress

Limitations: Firstly, we only examined anxiety but left other distal outcomes of stress such as wellbeing to be further studied. Secondly, we choose the decline rate of cortisol to represent the HPA-axis function instead of taking different systems into consideration. Thirdly, stress appraisal could be further examined in the challenge-hindrance stress researches in addition to different stressors.

Conclusions: The current study checked the association between stress and anxiety under the framework of challenge-hindrance stress. We examined the moderating mechanism of HPA-axis function, and discussed the effect of physiological toughness from the respective of resources and demands.

Keywords: challenge-hindrance stress; state anxiety; cortisol; TSST; HPA-axis function

1. Introduction

Nowadays, ungraduated college students are going through extreme and unexpected stress, young adults between 18 and 34 have already become the most anxious groups in Chinese society (Fu et al., 2021). Increasing researches attached attention to college students' anxiety and accumulating evidences supported there were associations between academic stress and students' anxiety, depression, as well as symptoms of physical illness (Macgeorge et al., 2005; Deb et al., 2015).

Anxiety is one of the riskiest consequences of stress (Smoller, 2015). Evidence from many countries shows that adolescent or college students' stress is positively correlated with their anxiety level (e.g., Deb et al., 2015; Trigueros et al., 2020). Biological evidence was also discussed to illustrate the strong association between stress and anxiety. While there is the similarity between stress-induced and anxiety-like behaviors, shared neural circuits were found under both states (Daviu et al., 2019). However, another fact is that stress does not necessarily lead to anxiety and may also bring some benefits, such as improving performance and resilience.

The response to stress depends on the nature, intensity and duration of a stressor, which at least partially translates into a dependence on the pattern of activation of the sympathetic nervous system, the adrenocortical axis and the other mediators of the stress response.

Researchers carried out surveys to examine the outcomes depending on stressors and distinguished that some stressors were bad, leading to poor performance and negative consequences such as family-work conflict. While some others were good, leading to improved performance and positive effects such as engagement increase (LePine et al., 2005; Crawford et al., 2010; Webster & Adams, 2015). The challenge-hindrance stress theory was initially proposed to explain these differentiated outcomes in the workplace in an empirical examination (Cavanaugh et al., 2000). The thought that stressors would lead to various consequences originated from Lazarus and Folkman's "two-stage appraisal process" (1984). They suggested that in the primary appraisal, an individual evaluated a stimulus as either stressful or not. Only when the stimulus was evaluated as stressful due to reasons such as loss, threat, or challenge, individuals would take the secondary appraisal to further evaluate their resources and coping strategies and decide whether they could handle the stress. According to this thought, challenge stress refers to those appraised as manageable, and hindrance stress refers to those unmanageable (O'Brien & Beehr, 2019). Previous research found that challenge and hindrance stress had a different association with behavior such as learning performance, through the indirect effect of motivation and exhaustion respectively (LePine et al., 2004). Exactly, motivation is positively related to challenge stress but negatively related to hindrance stress, while exhaustion is positively related to both challenge and hindrance stress. Therefore, challenge stress has a positive indirect influence on learning performance, while hindrance stress has a negative indirect influence on learning performance. As for stress coping, different coping behaviors were also found related to

challenge and hindrance stress. Challenge appraisal is positively related to problem-focused coping (Searle & Auton, 2014), and hindrance stress is more related to coping with negative emotions (Kahn, 1990; Crawford et al., 2010). Trait anxiety is a personal characteristic and is relatively stable. It stands for the trend to experience anxious. State anxiety is temporary feelings of apprehension, dread, and tension along with physiological arousal. It is easily influenced by stress events in environment. (Endler & Kocovski, 2001) Emotional-oriented coping was found to be positively related to state anxiety. In contrast, task-oriented coping is related to lower levels of state anxiety. (Endler & Kocovski, 2001; Endler et al., 1993) Therefore we suppose that, hindrance stress is positively related to state anxiety. However, the increased motivation and task-oriented coping partially offset the anxious consequence of stress. We then propose challenge stress is not associated with state anxiety.

Recent researches found some other moderating and mediating factors between stress and distal outcomes such as learning performance and health problems, including social support (Hackney et al., 2017), conscientiousness (Lin et al., 2014), and appraisal (Webster et al., 2011). However, the physiological mechanism is still to be examined to explain the difference outcomes under the challenge and hindrance stress framework.

Stress leads to a disruption of homeostasis. It can be caused by either an actual or an anticipated stressor. The hypothalamic-pituitary-adrenocortical (HPA) axis elevates the circuit of glucocorticoids in response to stress in a relatively slow approach. During this process, the level of salivary cortisol increases and peaks at about ten minutes after the initiation of stress. (Ulrich-Lai & Herman, 2009)

Researchers suggested that cortisol is not only an indicator of stress response, but also a function in coping with stress. According to a recent study, although going through the same stress tasks, those who were able to deal with stressful situation showed a lower cortisol response and less decrease in heart rate variability (Pulopulos et al., 2020). Evidences also show the association between insufficient stress coping skills and lower cortisol response to acute stress (Richardson et al., 2014). These results in some degree claimed that activity of HPA axis may be the possible physiological mechanism underlying valid stress coping.

Moreover, invalid coping may lead to mental disorders. Dysregulation of HPA axis function is found in anxiety disorders (Smoller, 2015). In morning, patients with generalized anxiety disorder have significant higher basal serum cortisol than healthy controls (Wang et al., 2017). These evidences further suggest potential association between dysfunction of HPA axis and anxiety disorders. The theory of allostatic load pointed out that, allostasis means an adaptive response to stressful events. However, allostatic load may otherwise lead to disease. The three types of allostatic load are frequent stress, the inadequate response of allostatic systems, and the failure to shut off after stress. (McEwen, 1998) According to physiological mediation model, a system with physiological toughness and fitness would lead to individual with emotional stability. The concept of physiological toughness describes an fit arousal pattern of both SNS and HPA axis reaction to stress. It is featured by low base level without

stressor, fast and strong arousal with stressor occur, and fast decline after stressor disappear. The model supposed that the suppressed cortisol level is a predictor of emotional stability, characterized by low anxiety, sadness, and general distress. (Dienstbier, 1989)

According to the allostatic load theory and physiological mediation model, the importance of the fast recovery of physiological system after stress was emphasized. Thus, we proposed that cortisol recovery after acute stress is also an important aspect of HPA axis function, which stands for system toughness and would moderate the relationship between stress and anxiety.

However, the theory of challenge and hindrance stress has been more examined through survey in the field of management. The physiological mechanism was also not firmly concluded so far.

In consideration of all above, we proposed two hypotheses. Hypothesis 1a and 1b predict the association between challenge and hindrance stress and state anxiety, and hypotheses 2 predict the moderating role of HPA axis recovery in the association between stress and state anxiety.

H1a: Hindrance stress is positively associated with state anxiety

H1b: Challenge stress is not associated with state anxiety

H2: Higher cortisol decline rate weakens the association between hindrance stress and state anxiety.

2. Methodology

2.1 Participants

In the current study, 137 college students were recruited to complete a stress task in laboratory and several questionnaires. 10 of them were excluded from following analyses due to lack of important data points. Among the 127 participants remain, their age range from 17 to 28 ($M = 22.46$, $SD = 2.47$), and 50.4 percent were male. All of them were physically healthy, without history of endocrine disease, neurological disease, or other serious chronic disease, also free from use of anti-psychotic medicine, neurological medicine, or adrenocortical hormones medicine. All the participants claimed they do not have long-term experience of excessive smoking or drinking.

2.2 Procedure

All the participants who engaged in our experiment signed agree before the task and were informed of their right to exit.

Upon their arriving on the day of the experiment, participants were asked to fill up several questionnaires. After that, they first rest quietly in a room. Baseline salivary sample were collected after rest. Then participants took part in the Trier Social Stress Test (TSST), approximately takes 20 minutes.

Right after the stress task, a second salivary sample data were collected. Then participant rest quietly in a room for 60 minutes. They were allowed to read scientific magazines. The third to the

tenth sample were collected during their rest, at the time point of 5, 10, 15, 20, 30, 40, 50, 60 minutes after the stress task respectively.

2.3 TSST

TSST is usually used as a classic and effective means to trigger acute stress in a laboratory setting, designed by Professor Kirschbaum from University of Trier. It is composed of a public speech task and an arithmetic calculation task.

In the speech task, each participant was asked to imagine that he is caught at a market when shopping, and is charged with theft by a security guard. He had to prepare a speech to defend himself. Participant had 5 minutes to prepare for the speech. Paper and pen were provided during the preparation but not allowed to take with them later during the speech. Each participant should give a 5-minute speech in front of market managers and guard who were acted by two experimenters. Participant was told that his speech performance would be recorded for analyses afterwards. In the case of participant finishing his speech within 5 minutes, the experimenters would give some standard prompts such as ‘You still have time, continue please.’, or ask some classic questions such as ‘Why should we trust you rather than the guard?’.

Right after the speech task, participants would take a calculation task. Each participant was asked to serially subtract 13 from 1022 and report the result loud. They were required to calculate as fast and correct as they could. Once incorrect result was reported, experimenters would immediately ask the participant to restart from 1022. The calculation task last for 5 minutes. After the task, participants would be taken back to rest.

2.4 Measures

2.4.1 Challenge-Hindrance Stress

The revised version of challenge-hindrance stressor scales we used (LePine et al., 2004) have two sub scales of hindrance stress items (e.g. “The amount of time spent on “busy work” for your classes.”) and challenge stress items (e.g. “The number of projects/assignments in your classes.”) respectively. Each item should be given a point on a 5-point Likert scale.

2.4.2 State-Trait Anxiety Inventory

State-trait anxiety inventory (STAI; Spielberger, et al., 1970) composes of 2 sub-scales: state anxiety and trait anxiety sub-scale. 20 items evaluated with a 4-point Likert scale were included in both state anxiety (e.g., “I feel calm”) and trait anxiety (e.g., “I am ‘calm, cool, and collected’”) sub-scale. The STAI has long been proved consistent and reliable. The Chinese version was translated by Wang et al. (1999)

2.5 Examinations

2.5.1 Salivary cortisol

During the experiment, 10 salivary samples in total were collected for each participant using “Salivette” device from Sarstedt, Rommelsdorf, Germany. Participants put the cotton swab in mouth and chew on it slightly for about 60 seconds, then put it back into the tube. Salivary samples were stored at -22°C until being examined to determine the cortisol concentrations with electrochemiluminescence immunoassay.

Cortisol level increased rapidly within the first 10 minutes after TSST to reach the peak, and then continued to decline to the baseline level until approximately 60 minutes after TSST. In the current study, cortisol response represents the peak cortisol level subtract the baseline level of a participant. Similarly, we use the difference between the peak level and 60-minute after stress level of cortisol to represent cortisol decline after stress. However, cortisol decline itself is greatly influenced by the peak cortisol level of, so that we use the ratio between cortisol decline and peak cortisol level to represent cortisol decline rate.

2.5.2 Statistical analyses

For the participants whose cortisol data was partially lost but still acceptable with important points recorded, the lost data points were reckoned with the other points of the same person. Statistical analyses were done by IBM SPSS 24.0. A p value < 0.05 is reported to be statistically significant.

We first adopt repeated measures ANOVA to examine the difference between baseline, right after stress, and after rest cortisol level to identify physiological response to stress. A regression model is investigated between state anxiety and challenge-hindrance stress to test whether stress could predict state anxiety. After that, we further investigate the moderate effect of cortisol decline rate on the relationship between challenge or hindrance stress and state anxiety.

2.5.3 Control variables

In data analyses, we controlled gender, age, and BMI. In analysis of the moderate effect of cortisol decline rate, we further controlled menstrual cycle.

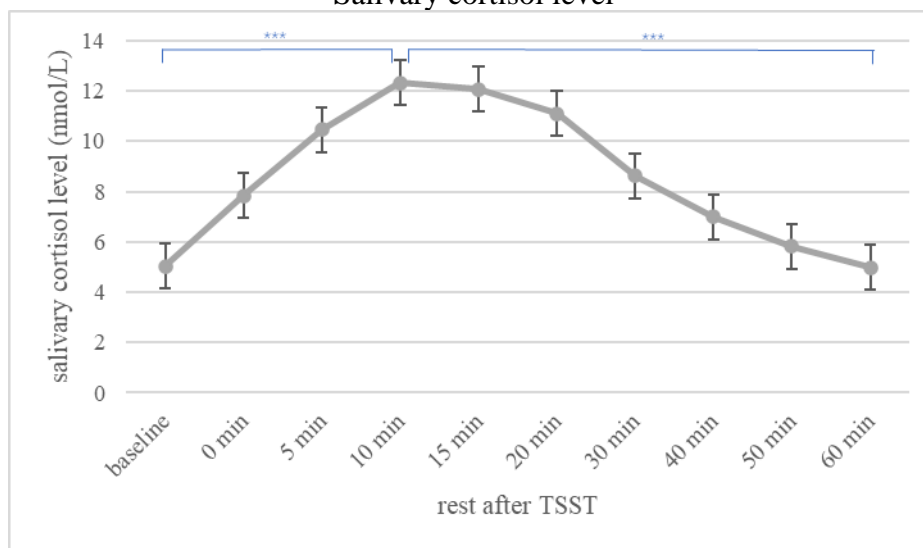
3. Results

Table 1 lists means, standard deviation, and correlations for related variables in the current study.

3.1 Manipulation check

The results of repeated measures ANOVA indicated significant effect of stress phase on cortisol level [$F(2, 122) = 3.94, p = 0.021$], confirmed the discrimination between cortisol level of baseline, peak and recovery, and suggested that TSST triggered stress effectively in the current study. Further results of multiple comparisons after ANOVA showed that peak cortisol level was significantly higher than baseline level ($p < 0.001$), and also significantly higher than recovery level ($p < 0.001$). But the difference between baseline and recovery level was not significant ($p > 0.05$). Figure 1 illustrates the increase and decrease trend of cortisol level.

Figure 1
Salivary cortisol level



Note: standard error of mean were marked by error bars. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

3.2 Hindrance/challenge stress and state anxiety

We first conducted linear regression analyses to test Hypotheses 1a and 1b which suggested some kind of stress could predict state anxiety. Table 2 shows the results. According to Table 2, hindrance stress was positively associated with state anxiety, $\beta = 0.299$, $p = 0.008$; but the association between challenge stress and state anxiety was not significant, $\beta = -0.19$, $p > 0.05$. The results supported Hypotheses 1a and 1b. Stress was positively associated with state anxiety, but the influences differentiated between hindrance and challenge stress.

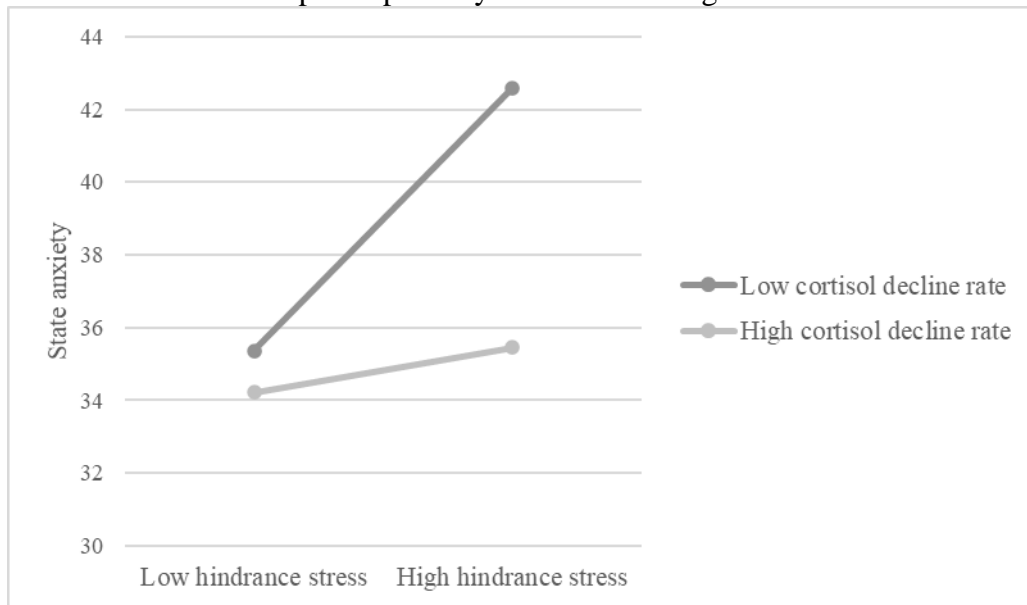
3.3 Moderate effect of cortisol decline rate

Then we examined the effect of cortisol decline rate after acute stress as a moderator using hierarchical multiple regression. Enter the control variables in step 1, then enter hindrance stress and cortisol decline rate in step 2, and their interaction in step 3. Table 4 depicts the results of moderated regression analysis. As we predicted in Hypothesis 2, the interaction was a negative and significant predictor of state anxiety ($\beta = -0.33$, $p = 0.013$, step 3). To give a straight illustration of the moderate effect, we then conducted simple slope analyses for the relationship between hindrance stress and state anxiety at one standard deviation above and below the mean of cortisol decline rate. Results are showed in Figure 3. According to the plot, when cortisol decline rate was low, hindrance stress was positively associated with state anxiety ($\beta = 0.94$, $p < 0.001$), but when cortisol decline rate was high, there was no significant relationship between hindrance stress and state anxiety ($\beta = 0.16$, $p > 0.05$). Thus Hypothesis 2 was supported.

As for the relationship between challenge stress and state anxiety, we did not discuss possible moderate effect since the relationship was just marginally significant. However, as a supplement, we

also tested whether cortisol decline rate would moderate the relationship between challenge stress and state anxiety, and finally found it not significant ($p > 0.1$).

Figure 2
Simple slope analyses of moderating effect



Note: low cortisol decline rate means one standard error under the mean value, high cortisol decline rate means one standard error above the mean value.

4. Discussion

The current study aims to clarify the relationship between daily stress and anxiety through the framework of challenge and hindrance stress, and examine the response of HPA axis to acute stress to explain the potential physiological mechanism. The results show that, firstly, recent hindrance stress could positively predict state anxiety, but challenge stress could not do. Secondly, the decline rate of cortisol after the acute stress moderates the association between hindrance stress and state anxiety, which indicates the function of HPA axis would help in reducing anxiety after stressful situation. Individuals with fast and thoroughly cortisol recovery will become less anxious after facing hindrance stress, while individuals with a delayed decline of cortisol after acute stress would feel more anxious due to hindrance stress in their daily life.

Previous researches thought that stress would lead to a series of negative outcomes, including anxiety as a most risky one. Later, challenge-hindrance stress model gave out a more precious relationship. Large amounts of researches verified that hindrance stress causes worse working performance and health problems while challenge stress is sometimes positive (LePine et al., 2005; Searle & Tuckey, 2017). Researchers thought that challenge and hindrance stress are responsible for different types of stress outcomes. It is hindrance stress that associated closely with anxious outcome of stress. A field study found that there was a significant positive association between hindrance stress

and anxiety under abusive supervision. But no evidence was provided to support a relationship between challenge stress and anxiety. (Mawritz et al., 2013) Similarly, a recent study also found that hindrance appraisal was positively associated with job-related anxiety while challenge appraisal did not significantly associate with anxiety (Ma et al., 2021). What's more, it was also suggested that physiological reactivities were different between challenge and hindrance stress (Turner et al., 2012). All of these results are consistent with our findings that hindrance stress could predict state anxiety but challenge stress could not.

The resources theory also provides an explanation for the distinguishment of challenge and hindrance stress from the aspect of resources and demands. The job demands-resources model assumes there are two processes respectively related to demands and resources. Firstly, demands cause an energy depletion process. Individuals put efforts to meet demands. They pay compensatory psychological and physiological cost, thus gradually get burnout. Secondly, resources cause a motivation increase process. Individuals believe that resources are helpful in achieving their own goals and development. They are then willing to devote themselves to the tasks. The model supposed that individuals would face stress when their resources are lost or threatened. The extended model further supposed that individuals feel challenge demands manageable and would like to devote more resources to overcome them. But as for hindrance demands, people believe they cannot achieve meaningful outcomes even using up their resources. As a result, people devote resources to dealing with emotional problems instead of handling the real demands. The unsolved hindrance demands remain consuming resources and increasing anxiety during a long time. (Crawford et al., 2010) Therefore, researches including our results find that the level of anxiety at one moment is positively related to hindrance stress people experienced during past few months.

However, the model did not reflect the sequence of demands and resources processes. In the current study, we emphasize the response to stress events especially during the recovery stage. The rather important finding of the current study is that, we found the moderating effect of cortisol decline rate after acute stress on the association between hindrance stress and state anxiety. According to the physiological toughness model, the fast and thorough recovery of cortisol after acute stress is an important aspect of physiological toughness (Dienstbier, 1989). The features of cortisol response represent the HPA axis function under stress. It can be viewed as a resource to buffer anxiety and other negative outcomes of stress. In accordance with the model, the moderating effect we found describes that individuals with strong HPA axis function face less anxious outcomes of daily hindrance stress, but individuals with relative weak HPA axis function develop more serious anxiety with hindrance stress level increasing. Individuals with physiological toughness have fast and strong arousal under stress, and invoke sufficient resources to cope with stressful situations. They need less compensation arousal in other systems and reduce relevant additional psychological and physiological consumption. What is more important, fast and thorough recovery of cortisol after stress also is an

aspect of strong HPA axis function. Fast recovery makes cortisol level decline to baseline, and allows strong and fast arousal in preparation for potential next stress. It helps in resource conservation so that individuals have enough resources to call next time. Fast recovery after each stressful event plays the role of an important resource to reduce negative impact of daily stress especially anxiety in our findings. So that people would be able to handle more stressful situations. Thus, we further support the resources theory and physiological toughness model by identifying the supposed relationship between HPA axis function and anxious outcomes of challenge-hindrance stress.

According to previous studies, stress is associated with anxiety, depression, and other mental health risks. Our studies found that, it is hindrance stress, but not challenge stress, that predicts state anxiety during a period of daily life. However, going through similar level of stress may still mean different costs for different people. Individuals with physiological toughness have stronger regulating function. They may be less likely to develop anxiety problems under stress. In contrary, individuals with vulnerable physiological systems may have difficulty relieving themselves from stress. It increases the possibility of them suffering from anxiety. The results somehow enlighten us on mental health care under stress. Even everyone could not burden quite stressful life, people can at least have knowledge of their toughness and arrange daily stress at an affordable level. We also suggest that, strong physiological systems could function as a resource to buffer anxiety and some other mental health problems due to stress. Otherwise, people who has less strong physiological function should look for other resources in order to prevent themselves from serious anxiety among daily stress. For example, people can seek family support or other social support (Koutsimani et al., 2021).

The current study still has the following limitations. We also expect future researches to be done as discussed below. First, we examined only anxiety to explain the negative outcomes of challenge and hindrance stress. Distal outcomes of stress including mental health is one of the ultimate questions people care about. There are other important variables such as wellbeing influenced by stress. Their associations with challenge and hindrance stress and the boundary of physiological function are still unclear. Second, we choose the decline rate of cortisol as an important factor to measure the HPA axis function during stress recovery and partially representing the function of physiological systems in response to stress. However, the physiological mediation model describes the concept of physiological toughness from a broad perspective including arousal, recovery, and repeated response in different systems. Future researches are expected to consider other features and different systems. It is hoped that we could finally measure the toughness in a more general way. Another limitation is that, we only used the stressor scales to distinguish challenge and hindrance stress. The criterion is all the same for different people. Lots of researches have verified the validity of challenge-hindrance stressor scales. The distinguishment of challenge stressors and hindrance stressors is fairly consistent for different people (Crawford et al., 2010; LePine et al., 2005). These evidences support the reliability of our results. Meanwhile, recent studies place more emphases on appraisal process in the challenge-

hindrance stress model (Mazzola & Disselhorst, 2019). It is proposed that a stressor could be appraised as both challenge and hindrance at the same time. Researches also supported that the appraisals mediate the relationship between stressors and their outcomes (Webster et al., 2011). Taking appraisal process into consideration would provide information of cognitive function besides physiological function in stress coping. It may also inspire ideas about active way in addition to passive way to cope with stress.

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Tables

Table 1
Means, Standard Deviation, and Correlations^a

	Variable	Mean	SD	1	2	3	4	5	6	7
1	Hindrance stress	12.67	3.84							
2	Challenge stress	14.27	4.20	0.60***						
3	State anxiety	36.69	7.90	0.25**	0.14					
4	Cortisol decline rate	0.52	0.32	0.14	-0.01	0.04				
5	Gender ^b	0.50	0.50	-0.02	-0.02	-0.07	-0.27**			
6	Age	22.46	2.47	-0.26**	-0.15	0.08	-0.11	-0.06		
7	BMI	21.24	2.59	-0.03	0	0.12	0.21	-0.48***	0.19*	
8	Menstrual cycle ^c	0.66	0.81	-0.04	0.04	-0.12	-0.19*	0.83***	0.03	-0.32***

^a n = 127.

^b Gender: 0 = male, 1 = female.

^c Menstrual cycle: 0 = male, 1 = luteal phase, 2 = follicular phase, 3 = ovulatory phase.

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

Table 2
Challenge stress / hindrance stress and state anxiety

	Variable	State Anxiety					
		<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β
Step 1	Gender	-0.167	1.606	-0.011	-0.006	1.555	0.000
	Age	0.196	0.291	0.061	0.436	0.291	0.136
	BMI	0.328	0.316	0.108	0.436	0.291	0.136
Step 2	Challenge stress				-0.035	0.202	-0.019
	Hindrance stress				0.615	0.226	0.299**
R^2		0.019			0.097		
ΔR^2		0.019			0.078		
Model <i>F</i>			$F(3, 123) = 0.797$			$F(5, 121) = 2.585$	

+ $p < 0.1$

* $p < 0.05$

** $p < 0.01$

Table 3
Moderate effect

		State Anxiety								
	Variable	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β
Step 1	Gender	3.340	2.736	0.212	3.485	2.684	0.221	3.082	2.630	0.196
	Age	0.249	0.291	0.078	0.488	0.294	0.152	0.397	0.290	0.124
	BMI	0.399	0.318	0.131	0.395	0.309	0.129	0.465	0.304	0.152
	Menstrual cycle	-2.486	1.575	-0.254	-2.474	1.527	-0.253	-2.719	1.497	-0.278 ⁺
Step 2	Hindrance stress				0.591	0.184	0.287 ^{**}	0.548	0.181	0.266 ^{**}
	Cortisol decline rate				0.004	2.263	0	-6.530	3.406	-0.264 ⁺
Step 3	Hindrance stress × cortisol decline rate							-1.232	0.488	-0.332 [*]
<i>R</i> ²		0.039			0.116			0.161		
ΔR^2		0.039			0.077			0.045		
Model <i>F</i>		<i>F</i> (4, 122) = 1.228			<i>F</i> (6, 120) = 2.618 [*]			<i>F</i> (7, 119) = 3.255 ^{**}		

+ *p* < 0.1
* *p* < 0.05
** *p* < 0.01